

Tentative  
translation

# **Study Group on the Utilization of Metaverse towards the Web3 Era**

## **Report Outline**

July 18, 2023

Study Group on the Utilization of Metaverse towards the Web3 Era

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## (1) Expectations for Metaverse, etc. (1/2)

### Background to metaverse

The first attempts to create virtual spaces on computers began in the 1980s. Metaverse has gained considerable interest in the last several years as a type of virtual space that incorporate elements of online gaming, social media, online meeting services, and other features.

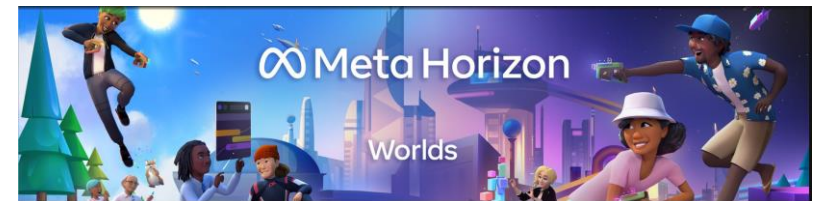
- The first virtual space to gain any real prominence was Second Life in 2003. Second Life is a three-dimensional (3D) virtual space constructed on the Internet. Currency used in the virtual space can be exchanged for physical space currencies and land in the virtual space can be bought and sold.
- Since the late 2010s, 3D online gaming platforms like Fortnite (2017) and Animal Crossing: New Horizons (2020) began being used as communication tools, going beyond the purpose of the games themselves. People began calling these services metaverse\* platforms.
- In 2021, the social media giant Facebook, Inc. announced it would be changing its corporate name to Meta Platforms, Inc., to reflect its increased focus on its metaverse business. Along with metaverse quickly gaining recognition among the general public, a rising number of companies jumped into the metaverse domain.

Second Life



Source: Second Life <https://secondlife.com/destination/harajuku-event>

Meta Horizon Worlds



Source: Meta Horizon Worlds <https://www.oculus.com/experiences/quest/2532035600194083/>

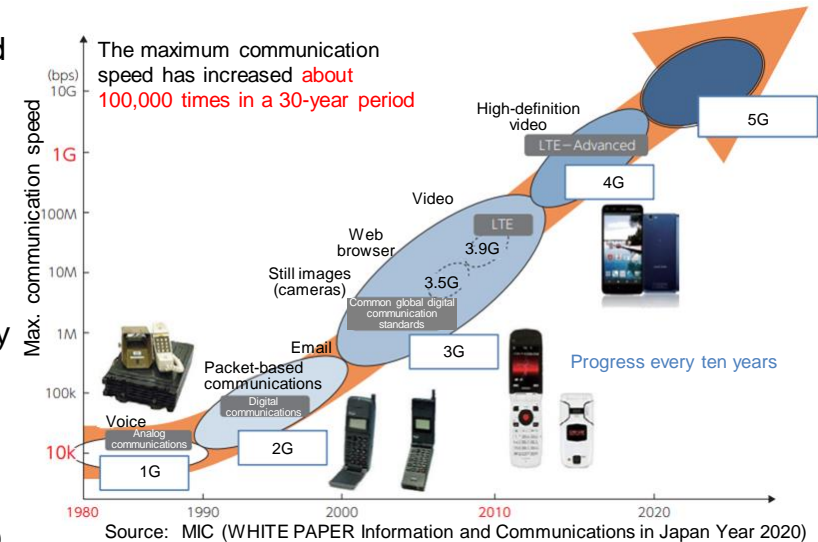
\*Metaverse is a portmanteau of *meta* and *universe* and is taken from the name of a virtual urban environment that appears in *Snow Crash* by Neal Stephenson, published in 1992.

## (1) Expectations for Metaverse, etc. (2/2)

### Background factors contributing to the metaverse's prominence

- Huge advances have been made in communication infrastructure. For example, maximum mobile communication speeds in Japan have jumped about 100,000 times in a 30-year period, and Japan's Internet traffic has increased by about 13 times in a 10-year span.
- As improvements were being made to our communication environments, the performance of the cloud was also improving over the decade since Second Life came on the scene in the early 2000s. Cloud performance is important, as it underpins the construction of virtual spaces. Exceptionally fast processing of massive amounts of data made it possible to render very detailed landscapes and movements.
- Another factor was the development of head-mounted displays (HMDs). HMDs allow users to immerse themselves in highly realistic, real-time 3D images. This, in turn, meant users could enjoy life in a virtual space for long periods of time with a feeling similar to physical spaces.
- In addition, following on from Web 1.0 and Web 2.0, the next Internet trend was advocated for Web3, the idea of a decentralized online ecosystem that is backed by distributed ledgers and blockchain technology.
- In metaverse, users can create and customize content and spaces — so-called user generated content (UGC) — and the virtual space functions as a place for economic activities like trading UGC and other items. Because of these characteristics, metaverse is often discussed alongside Web3.\*

### Improved communication speeds



### Example of massive data processing using the cloud



Source: Materials from the Microsoft Japan presentation at the Study Group's 9<sup>th</sup> meeting

\*As will be discussed later, Web3 is not a prerequisite for metaverse and should be regarded as a non-essential element.

## (2) Progress with Metaverse, etc. Use and Application

### Examples of metaverse uses and applications

The following services, as examples of fields and applications of metaverse and other virtual spaces, were introduced at the Study Group meetings, primarily in the form of presentations.

- (1) Developing communications and holding events within virtual spaces
- (2) Virtual offices and other business applications that enable office-like communications even as workers work remotely
- (3) Creation of digital twins of cities in a metaverse space (promote visits to the real space through events and other content held in the virtual space)
- (4) Universities and other educational institutions hold lectures in metaverse and classes in virtual reality spaces
- (5) Industries, such as manufacturing and construction, make use of digital twins and metaverse, etc.
- (6) Virtual spaces are used for economic activities and entertainment through attractions and markets in virtual spaces that users can participate in

#### (1) Communications and events



Source: Materials from the Shiftall presentation at the Study Group's 9<sup>th</sup> meeting

#### (2) Business applications and telework



Source: Materials provided by oVice

#### (3) Metaverse and digital twins that recreate cities



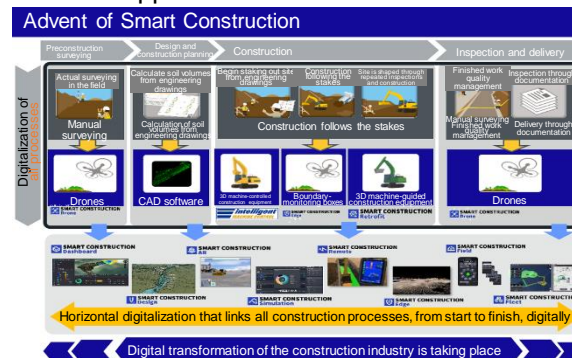
Source: Materials provided by DNP

#### (4) Lectures, education, and culture



Source: Materials from Study Group member Amemiya's presentation at the 2<sup>nd</sup> meeting

#### (5) Industrial applications



Source: Materials from the Komatsu presentation at the Study Group's 4<sup>th</sup> meeting

#### (6) Economic activities and entertainment

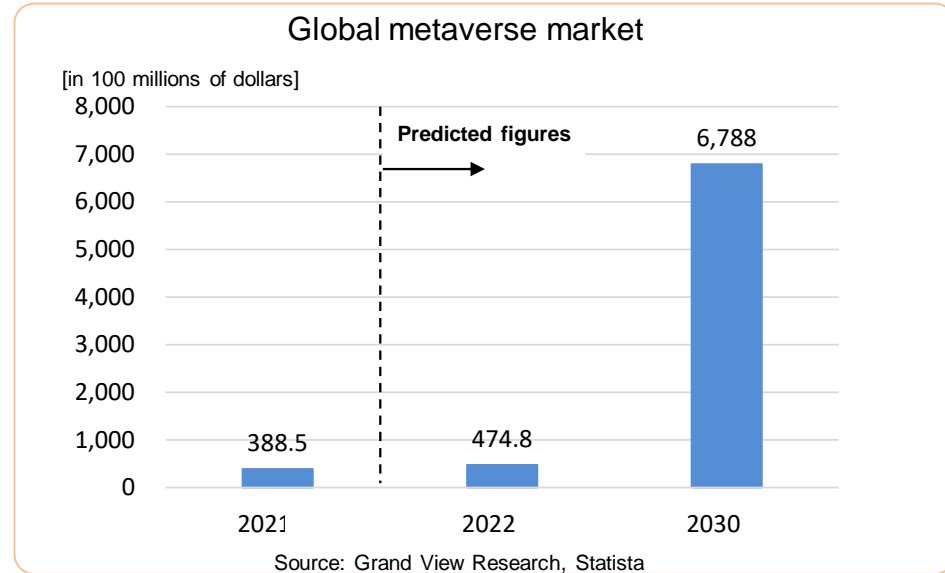


Source: Materials from the HIKKY presentation at the Study Group's 6<sup>th</sup> meeting

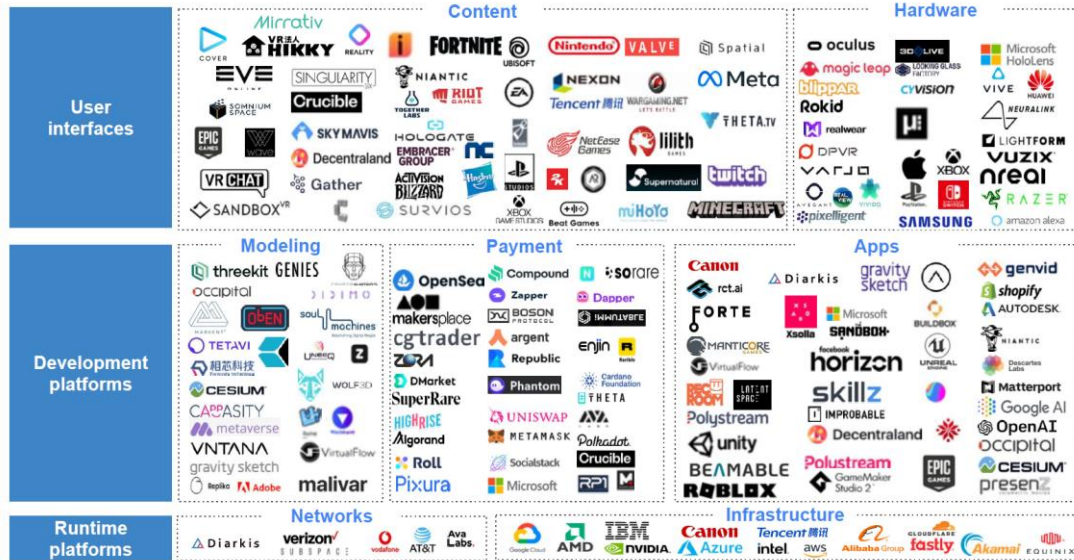
# (3) Current Metaverse Market Size and User Numbers (1/2)

## Metaverse market

- The global metaverse market is predicted to reach 678.8 billion U.S. dollars by 2030 and be about 17 times larger than in 2021. (The Japanese market is believed to account for about 10 percent of the total market.)
- Market competition is ramping up, with the entry of various players, particularly companies that are already involved in online gaming and online gaming infrastructure. Japanese companies like Sony and Nintendo have also entered the market, and Japan is home to several metaverse start-ups.
- Some immersive metaverse services that use HMDs have achieved over 20,000 simultaneously connected users.

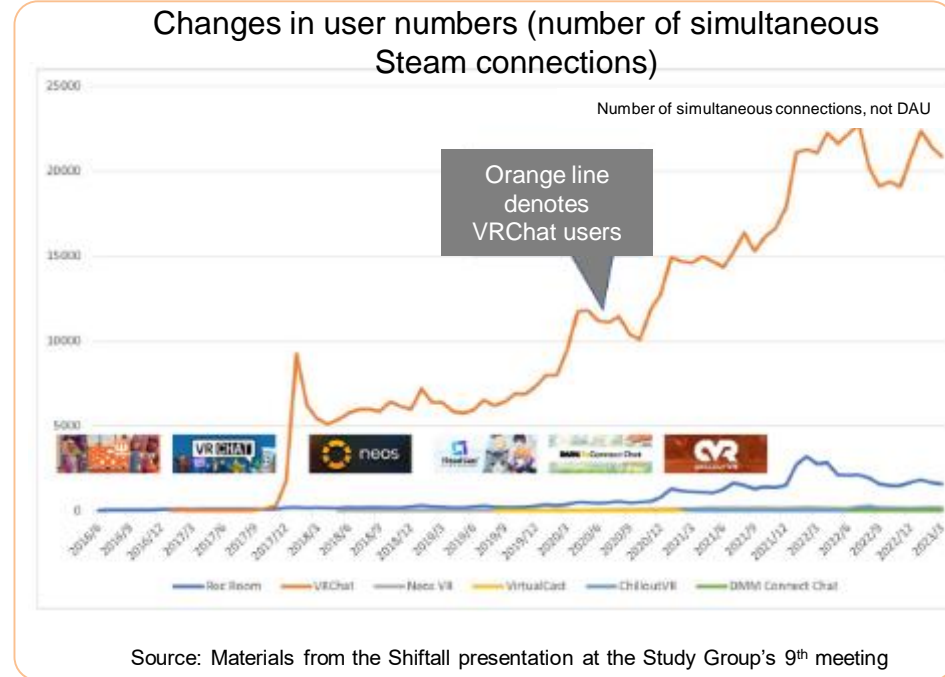


## Metaverse chaos map



Source: Materials provided by Diarkis Inc.

Made by Diarkis



### (3) Current Metaverse Market Size and User Numbers (2/2)

#### Current metaverse awareness and usage

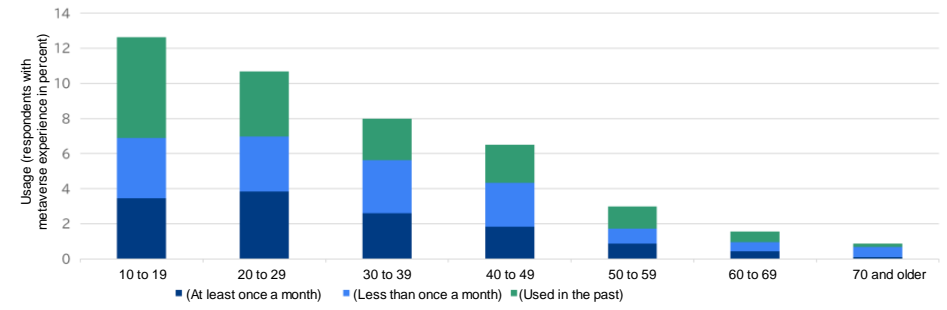
- In a December 2022 survey conducted in Japan, over 80 percent of respondents said they knew the term “metaverse” (this figure includes people who had heard the term, but did not know it well enough to explain it), but slightly less than 12 percent said they knew the term well enough to explain it to others. This latter group had more than doubled (4.5 percent to 11.6 percent) in just half a year since the previous survey in June 2022, indicating that awareness of “metaverse” is increasing steadily.
- As of December 2022, just under 5.5 percent of respondents said they had actually used a metaverse (respondents with metaverse experience) and about one-third of these said they use a metaverse space at least once a month.
- Among respondents with metaverse experience, around 60 percent used a smartphone or tablet as their main access method, while 20 percent used computers or other flat displays and 20 percent accessed via HMDs.

Current metaverse awareness and usage

			Men (%)	Women (%)	Average response rate (%)	Total for men and women
Awareness (June 2022)	Knew	Know it well enough to explain it	6.3	2.5	4.5	1594
		Don't know it well enough to explain it	62.8	53.4	58.2	20860
	Don't know		30.9	44.1	37.3	13373
Awareness (December 2022)	Knew	Know it well enough to explain it	16.5	6.7	11.6	1162
		Don't know it well enough to explain it	70.8	72.6	71.7	7170
	Don't know		12.7	20.7	16.7	1668
Usage (December 2022)	Have used	At least once a month	2.3	1.1	1.7	172
		Less than once a month	2.8	0.9	1.9	185
		Used in the past	2.7	1.1	1.9	189
	Never used		92.2	96.9	94.5	9454
Main access method (December 2022)	Smartphone / tablet		59.2	61.7	59.9	327
	Computer / gaming device (2D)		17.4	19.5	18	98
	VR-HMD	Simplified VR device	7.1	10.4	8.1	44
		HMD connected to gaming device	6.6	2	5.3	29
		Standalone HMD	3.1	2.6	2.9	16
		Full HMD connected to computer	4.9	0.7	3.7	20
Virtual reality facility		1.8	3.3	2.2	12	

#### Metaverse usage by age group and location

- The percentage of respondents with metaverse experience rose the younger the age group, reaching over 10 percent among respondents under 20. Awareness was also higher the younger the age group, with over 20 percent of respondents between 10 and 19 answering they knew the term well enough to explain it to others.
- Comparing metro areas (Japan’s three major metro areas) versus other areas (all areas outside the three major metro areas) found that, on the whole, respondents, after controlling for age groups, in metro areas were more likely to be aware of “metaverse”. The difference between age groups, however, was more pronounced than location differences.



Source: Metaverse use and awareness survey results, Mitsubishi Research Institute, inc.

## (4) International Metaverse Trends (1/2)

### Major developments in other countries and regions

#### United States

- The U.S. Congressional Research Service has reported on expectations and characteristics surrounding metaverse, summarized its related technologies and businesses, and detailed policy issues.
- It raised issues such as content moderation, data privacy, dominance of metaverse platforms by large corporations, and the digital divide.

#### Europe

- In the EU, the Council of the European Union and the European Parliament published policy documents on metaverse in 2022 and the European Commission plans to make a policy decision in 2023.
- Both the Council of the European Union and the European Parliament documents raise issues surrounding personal data and privacy. The Council of the European Union document also mentions democracy and values and safety and security, and the European Parliament document mentions the competitive environment and obligations to report illegal or harmful information.
- In France, a group of researchers commissioned by the government has published policy recommendations, stressing the importance of France maintaining its own strategy, including the involvement of public authorities.

#### China

- At the central government level, there is no comprehensive document that explicitly summarizes metaverse policy issues or strategies. There are only policies to deal with individual issues.
- Shanghai is considered to be the most advanced local government on metaverse, positioning metaverse as a key element in the region's digital transformation push and formulating a concrete action plan.

##### — 14th Five-Year Plan for the Development of Shanghai's Digital Economy

The plan selected metaverse as an advanced technological field where R&D capacity should be strengthened and ways to apply metaverse to industry should be considered. It sets quantitative targets for the field, such as expanding the market to 350 billion yuan (6.9 trillion yen) and creating more than 10 leading innovative companies and more than 100 specialized ventures by 2025.

#### South Korea

- South Korea announced the Emerging Metaverse Industry Promotion Strategy as a national strategy in January 2022. The country has launched investments into metaverse ecosystem and into an M&A fund as well.
- The city of Seoul launched Metaverse Seoul, a metaverse platform that provides government services in virtual space.



## (4) International Metaverse Trends (2/2)

### Developments at international institutions and organizations

#### The Metaverse Standards Forum

- The Metaverse Standards Forum was set up in June 2022 to coordinate standardization bodies in support of the creation of standards for metaverse interoperability.
- Nine groups are currently underway, studying issues such as data formats and compatibility, network requirements, and security.
- Japanese companies are pushing for the standardization of VRM, a standard for 3D avatars that are platform independent and cross-platform compatible.

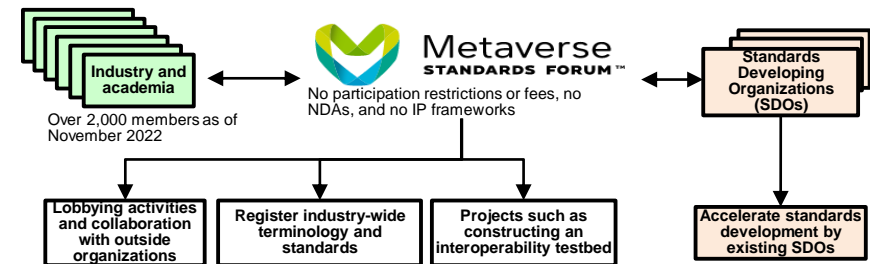
#### ITU-T

- The ITU-T set up the Focus Group\* on metaverse (FG-MV) in December 2022 to study metaverse-related standardization.
- ITU-T study groups on security, communication requirements for wired transmission of content, and digital media coding are also studying standardization toward metaverse interoperability.
  - SG9: Broadband cable and TV is standardizing network platform requirements for cloud-based virtual reality services.
  - At SG16: Multimedia, Asian countries in particular are actively working on digital media coding.

#### G7

- The *G7 Hiroshima Leaders' Communiqué* from the Hiroshima Summit (May 19 to 21) and the *Ministerial Declaration of the G7 Digital and Tech Ministers' Meeting* (April 29 and 30) mentioned that metaverse and other immersive technologies should continue to be updated in line with our shared democratic values.

### Concept of the Metaverse Standards Forum



Source: Adapted from materials presented at the Study Group's 7<sup>th</sup> meeting

#### *G7 Hiroshima Leaders' Communiqué (May 20, 2023)*

38. [...] In areas such as AI, immersive technologies such as the metaverses and quantum information science and technology and other emerging technologies, the governance of the digital economy should continue to be updated in line with our shared democratic values. [...]

Source: Ministry of Foreign Affairs, <https://www.mofa.go.jp/files/100506907.pdf>

#### *Ministerial Declaration of the G7 Digital and Tech Ministers' Meeting (April 30, 2023)*

38. We continue discussions on the ways to develop our collective approaches on immersive technologies such as the metaverse. We recognise the potential of immersive technologies to provide a myriad of innovative opportunities for different areas and use cases and the need for policy discussions on interoperability, portability, and ecological sustainability and standards to support these aims as well as to foster a trustworthy, safe and secure use of the technologies based democratic values while maintaining a free open and fair global economic architecture. We recognise the role that international organisations could play in this regard and seek to continue contributing to on-going discussion in relevant multilateral fora including the OECD.

Source: MIC, [https://www.soumu.go.jp/main\\_content/000879099.pdf](https://www.soumu.go.jp/main_content/000879099.pdf)

\*Focus Group: A short-term group, open to non-members of the ITU as well, set up to gather a wide range of information for consideration in the formulation of ITU Recommendations.

## (1) Defining Terms Related to Metaverse, etc. (1/2)

### Arranging concepts and terms considered by the Study Group

- As virtual space services emerge one after another, as illustrated in Section 1(2), it becomes important to consider how to arrange the subject matters and related terms to be considered by the Study Group.
- Some of these services rely on virtual reality technology, but others make use of augmented reality, mixed reality, and similar technologies that add or augment virtual information to physical spaces via networks. These latter services (a) have relatively few virtual space elements and (b) vary widely in terms of their components, such as the existence of avatars. Consequently, it is necessary to clearly distinguish between the terms and organize the discussion points of interest, while keeping the Study Group's scope sufficiently broad.
- Based on this approach, the Study Group decided to use the term *metaverse, etc.* to broadly describe virtual space-related services and reserve the word *metaverse* for virtual spaces that use virtual reality, particularly those that allow for communications via avatars. Further to this, the Study Group decided to make discussions about metaverse spaces the main focus of its investigations.
- Additionally, although Web3 and metaverse are frequently discussed alongside each other, the Study Group is of the view that the two concepts are not directly connected and that they should be understood as developing independently, despite having some aspects that are connected. At the same time, the Study Group is aware that the connections between the two concepts should always be kept in mind. Another viewpoint is that it should not be forgotten metaverse makes it possible to take part in new economic activities like NFTs and crypto assets and to connect to the external economy through these activities. From this perspective, it is important to observe the relationship between Web3 and metaverse.

# (1) Defining Terms Related to Metaverse, etc. (2/2)

## Definition of *metaverse*

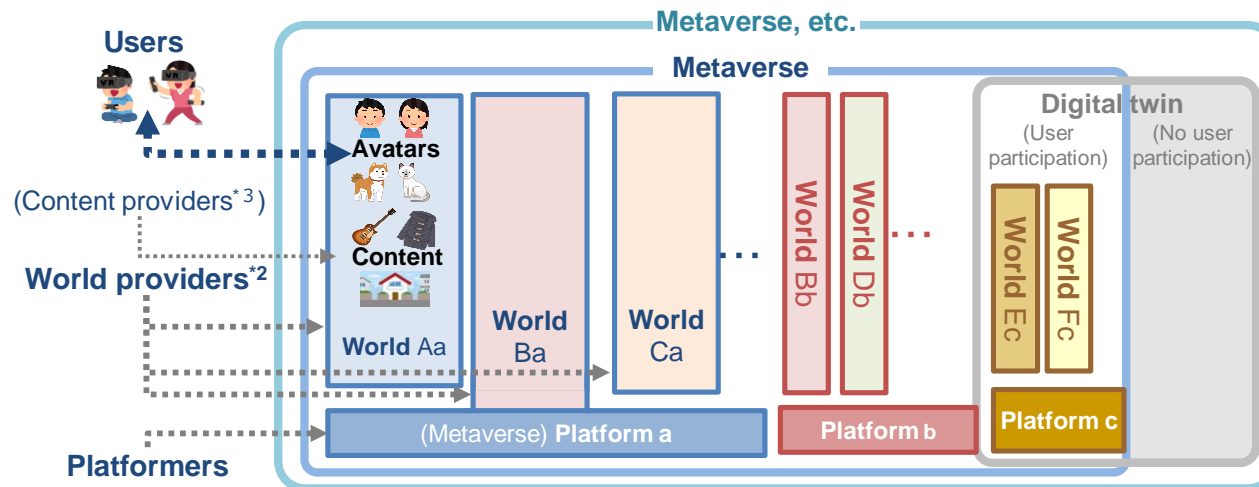
A metaverse is a virtual digital space accessible via the Internet or other network where communication among users is possible. The definition of metaverse assumes the following four elements are in place. Note that when determining whether a specific virtual space service has each of the elements below, it is necessary to make reference to the general level of technology in use.

1. The space has a **sense of realism** and **reproducibility**<sup>\*1</sup> appropriate to its purpose of use.
2. The space provides the **sensation of self-projection** and **immersion**.
3. The space is **interactive** (in real time in most cases).
4. **Anyone can participate in the virtual space** (openness).

Many of these metaverse spaces are constructed as 3D virtual spaces and require the use of a virtual reality device. However, others can be accessed from smartphones and other common devices, and some metaverse intended for business are constructed in 2D. Consequently, a metaverse may have any or all of the following three elements.

5. Virtual spaces can be interconnected, permitting users to move between different virtual spaces and use the same avatars and items in multiple virtual spaces (interoperability).
6. The virtual space is permanent, not set up as a temporary event.
7. Activities (such as economic activities) can be performed in the virtual space that are similar to those in real space.

Conceptual diagram of terms related to metaverse



Source: Adapted from materials presented at the Study Group's 7<sup>th</sup> meeting

\*1. When recreating physical spaces, some metaverse spaces use so-called digital twins while others construct simplified models of physical spaces or build worlds whose rules, including their laws of physics, differ from physical spaces.

\*2. In some cases, the platformer provides the world (World Ba in the diagram above).

\*3. In some cases, there is a platformer and a world provider. Content may include items and other accessories.

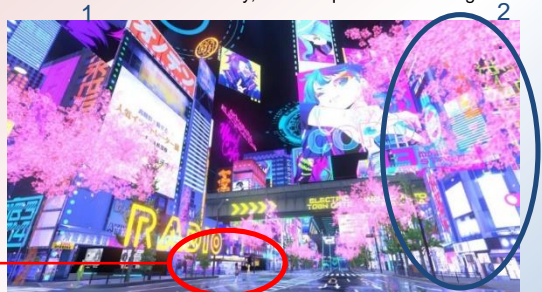
## (2) Metaverse Characteristics and Arranging Associated Discussion Points

### Metaverse characteristics

- Based on its discussions so far, the Study Group considers the following to be the current characteristics of a metaverse space.
  - Avatars exist for users to enter and take part in the virtual space
  - Reproduces buildings and structures in physical spaces (in metaverse designed to mimic a real space)
  - A diversity of metaverse spaces exist, driven by the market entry of many platformers and other businesses
  - The uptake of metaverse is ongoing, due to the price of virtual reality devices and other equipment and technical issues, such as latency caused by system and network loading

#### Understanding of users

Avatar existence → Identity, data acquisition and usage



Reproduction of buildings (1 and 2) → Clarity at time of construction, use, and application

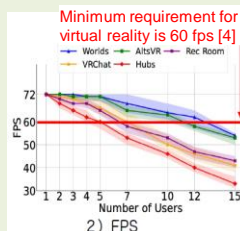
#### Creation of use cases

- Existence of multiple platforms → Interoperability, UI and UX
- Technical issues → Future developments and social impact



\*2

Impact on society and infrastructure



\*3

### Arrangement of discussion points

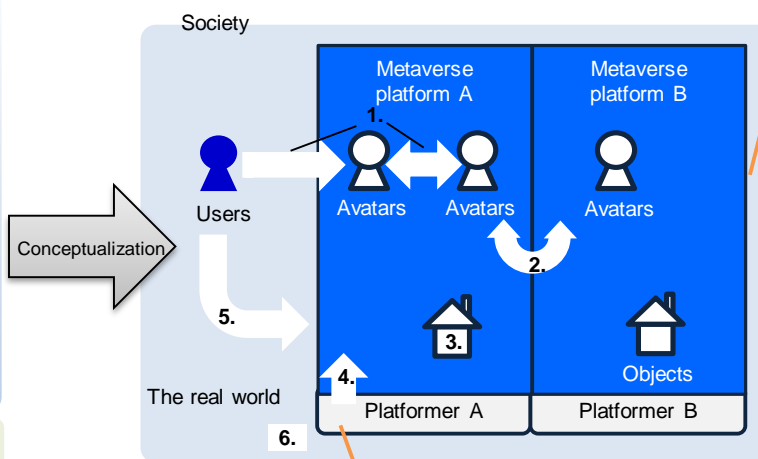
- For the interim report, discussion points were arranged along three perspectives: Understanding of users, Creation of use cases, and Impact on society and infrastructure.
- Based on the interim report and subsequent discussions, the Study Group decided to rearrange and study discussion points and issues along two perspectives: Issues within the metaverse space, particularly avatars (points 1 to 4 below), and Issues external to the metaverse space (points 5 and 6 below).

#### Issues within the metaverse space

- Issues related to avatars
- Interoperability among platforms
- Issues when constructing, using, and applying metaverse
- Issues related to data acquisition and usage

#### Issues external to the metaverse space

- Issues related to user interfaces (UI) and user experiences (UX)
- Metaverse developments and social impacts



\*1. Source: Akihabara Area Tourism Organization Inc. and Dai Nippon Printing Co., Ltd.

\*2. Source: Materials from the Shiftall presentation at the Study Group's 9<sup>th</sup> meeting

\*3. Source: Materials from the Study Group member Tsukuda's presentation at the 6<sup>th</sup> meeting (originally taken from Lai et.al, "Furion: Engineering High-Quality Immersive Virtual Reality on Today's Mobile Devices", 2017)

## (1) Issues Related to Avatars (1/2)

### Issues related to the actions of users controlling avatars and their impact on other avatars (Status of discussions on the actions of and to avatars that may occur in metaverse and the rights of avatars)

#### Types of actions in metaverse

- Potential acts of aggression related to metaverse include attacks on virtual reality visibility, equipment, and biofeedback, doxing individuals, stalking, and impersonating people's characters, as well as eavesdropping, non-consensual photography, and other illegal acts against users.
- At the same time, it should be noted that acts by means of an avatar in a virtual space that obstructs another person are materially different from acts in physical spaces that endanger lives or have other lasting effects. Therefore, discussions from psychological viewpoints and from physical viewpoints should proceed separately.

#### Status of discussions on the rights of avatars

- The Public-Private Partnership Conference on New Legal Issues Concerning Content in the Metaverse (Public-Private Conference) summarized issues in this area in May. The Public-Private Conference discussed portrait rights and publicity rights regarding avatars that imitate other real people as well as the possibility of created avatars violating these rights. The Public-Private Conference put together future measures to be taken by relevant parties.
  - For example, regarding the creation and use of an avatar that imitates the likeness of a real person, it is recognized that in many cases the intentional creation and public exposure of an avatar, from whose appearance the real person can be identified, can be considered an infringement of the real person's portrait rights, from the point of view of the psychological impact of the avatar's creation and use.
  - A new topic of discussion concerns the fraudulent use of another created avatar's portrait or design. At question is whether such use may be subject to portrait rights if the avatar's appearance is linked to the character of the avatar's operator. Suggested measures to counter fraudulent use based on copyrights include exercising rights as a derivative-work creator, seeking damages if the creator has entered an exclusive license, or subrogation of the right to injunctive relief.
- The Public-Private Conference also discussed the application of laws to identities and things in metaverse other than avatars.
  - In view of the expanded use of intellectual property that intersects both physical spaces and virtual spaces, the ordinary Diet session this year plans to address, through amendments to the Unfair Competition Prevention Act and other legislation, imitations of real space designs in virtual spaces, the use of utility good designs crossing real spaces and virtual spaces, and unauthorized use of real-world symbols and logos in virtual spaces. Measures for trademark holders to counter these issues thought to be effective include filing to register product trademarks for both physical and virtual spaces.
  - On the other hand, examinations of trading virtual objects using NFTs or other means are generally interpreted as purchased virtual objects to not benefit from ownership rights or property rights, which are the rights to control tangible things. The rights held by holders of virtual objects are usage rights, meaning the right to access and use the virtual object's digital data. In other words, these rights are positioned as obligatory rights based on contract, and their effect is considered valid only between parties to the contract.
- When implementing initiatives considering the findings of the Study Group, **it will be necessary to cooperate and coordinate with measures taken by the government and business entities based on the Public-Private Conference's summary of issues.**

## (1) Issues Related to Avatars (2/2)

### Responsible entities when a single avatar operated by multiple people, a corporate avatar, or a NPC avatar has become a perpetrator

- It is important to clarify an approach to responsibilities, as users often work in metaverse from the standpoint of a business or are the main entities providing UGC.
- The view was presented at the Study Group that, although it is possible to apply concepts like joint unlawful acts or coprincipals in crime to problematic actions by an avatar controlled by multiple people, it may be difficult to reach a legal conclusion at the present time. Another opinion voiced was that if an NPC avatar, whose movements are automated by a tool, always commits actions that violate public order and morals when a certain behavior is taken, the responsibility for those actions lies with the tool provider.
- Looking forward, once a certain number of case studies have been accumulated and analyzed, it is important to publicize the case studies among users.

### Impact on users controlling avatars (Matters for consideration when examining actions in a metaverse)

#### Understanding the relationship between the avatar and the operator's identity

- Discussions on avatars used in metaverse should first acknowledge that the percentage of themselves that users project on avatars varies depending on the use case, and that it is difficult for other users, who are third parties, to recognize the degree of self-projection in an avatar.
- For example, the act of taking an image without authorization of the appearance of another avatar (such as taking a screenshot), assuming the avatar's appearance is not subject to portrait rights and an operator exists, may violate portrait rights in the same way as directly photographing the appearance of a real person's physical body, since the photographed portrait is still the portrait of the avatar operator. However, in the case that no avatar operator exists, the same argument might not apply.
- Regarding Vtubers, there are cases where the public disclosure of a photo of the performer's face, in a manner in which the particular performer can be identified, has been regarded as a privacy violation, as the avatar operator's information has been exposed. There are also cases where slander against the avatar operator incorporating the operator's voice and movements has been recognized as defamation. It is presumed that courts will pass down similar rulings to these cases with respect to acts against avatars on metaverse that have operators.
- On the other hand, potential issues to be addressed in the future include the exposure of facial expressions, movements, and other information as an avatar and whether or not defamation can be established against characters whose sameness with the operator is not recognized.
- **Other users having the capability to identify whether an operator exists or not may be important in some situations.** Correctly tying the operator to a person in real space may be required, depending on the necessity of the use case. On the other hand, it is necessary to examine to what extent and in what manner such information should be disclosed to other users, so as not to cause privacy violations or other damages to the avatar operator.

#### The public / private nature of metaverse spaces where actions take place

- Opinions were given at the Study Group, using spoofing as an example, that there should be careful consideration of setting legal obligations that limit the self images an avatar itself can permit for display in a private environment of another person.
- On the other hand, opinions were voiced that metaverse spaces without this private nature should continue to be discussed as whether being deemed public spaces where people should tolerate being photographed in the same way as on public roads and streets.

## (2) Interoperability Among Platforms

### Standardization of virtual reality data

#### Compression coding methods applicable to virtual reality

- H.266 / VVC<sup>\*1</sup> was standardized in 2020 as a video compression technology for 2D data
- Two international standards are in progress as compression technologies for 3D point cloud data
  - Video-based PCC<sup>\*2</sup> ... Used for avatars
  - Geometry-based PCC ... Used for buildings and other spatial structures

#### 3D avatar standard

- The Japan-originated VRM 3D avatar standard<sup>\*3</sup> is a format with the following characteristics. The VRM Consortium, which promotes the standard, is currently facilitating discussions at research groups at The Metaverse Standards Forum, formulating avatar standards, and implementing game engine libraries. All its activities are carried out by volunteers from member companies.
  - Data format is based on glTF<sup>\*4</sup>
  - Specification has an intermediate layer that absorbs differences in avatar movement implementations between applications and ensures compatibility with an API
  - Unique licenses can be granted that account for consent with respect to an avatar's character

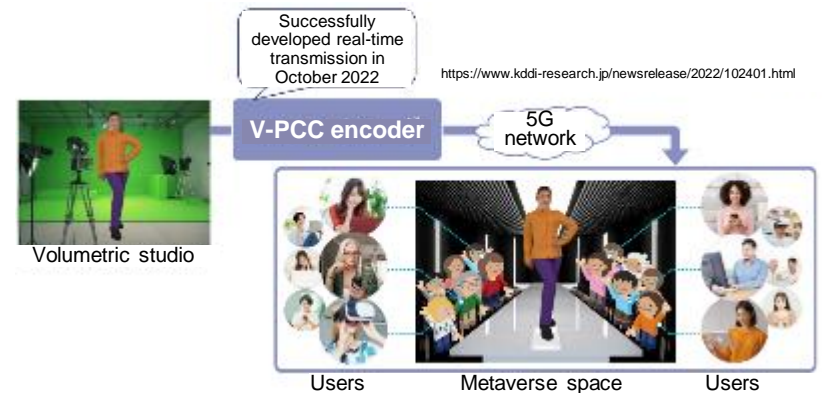
### Standardization of system requirements depending on the use case

#### Network platform requirements for cloud-based virtual reality services

- Being standardized<sup>\*5</sup> by ITU-T SG9: Broadband cable and TV
  - End-to-end latency Less than 30 ms (RTT)
  - Overall jitter Less than 15 ms
  - Packet loss requirement  $10^{-4}$  or less

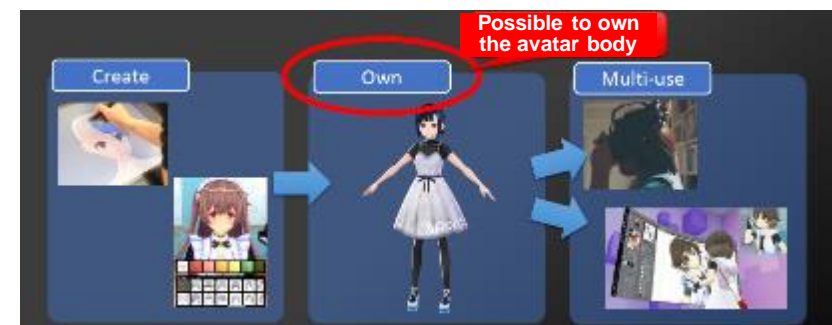
- **Along with continuing to push ahead with standardization at international bodies, an important issue is how to move ahead with private sector initiatives.**

Realizing real-time coding of dynamic point clouds over existing communication network.



Source: Materials from the KDDI presentation at the Study Group's 6<sup>th</sup> meeting

### Interoperable avatar formats



Source: Materials from the VRM Consortium, Inc. presentation at the Study Group's 8<sup>th</sup> meeting

\*1. Versatile Video Coding

\*2. Point Cloud Compression

\*3. VRM-1.0 (<https://vrm.dev/en/vrm1/>)

\*4. GL Transmission Format, a file format for displaying 3D models and scenes on Web browsers using JSON. The format was established by Khronos in 2000.

\*5. ITU-T J.1631 (<https://www.itu.int/rec/T-REC-J.1631-202111-I/en>)

## (3) Issues When Constructing, Using, and Applying Metaverse (1/3)

### Handling data that captures protected private information

- There is a need to handle situations when 3D models are built using data photographed by people or drones and the captured data includes people, automobiles, and other protected private information. (The Copyright Act contains a rights limitation provision (Article 30-2) for incidentally captured works.)
- Cases are envisioned where there are insufficient human resources or where digital twins are generated in real time. Efficiency is important in these cases by, for example, using AI for image analysis and image processing.

### Handling data related to buildings and other structures in physical spaces

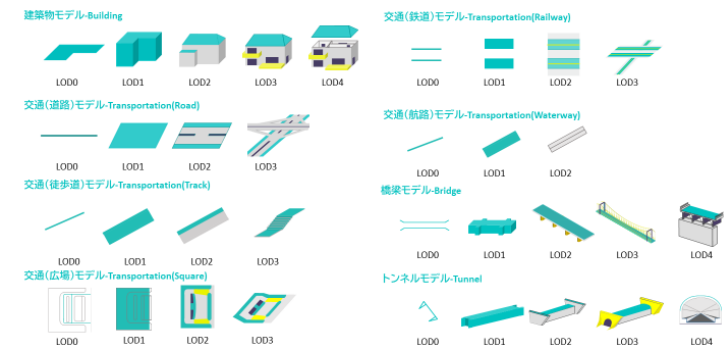
- When reproducing 3D models of physical spaces including their structures and ancillary objects, the models are often constructed after an agreement has been reached with the space's administrator or landowner.
- On the other hand, buildings are not subject to moral rights, and Article 46 of the Copyright Act specifies rights limitations for copyrightable works.
- It is necessary to strike a balance between rights and usage, while keeping in mind the **importance of eliciting the understanding of administrators and landowners to ensure the smooth and stable promotion of metaverse businesses.**
- In this regard, **the Ministry of Land, Infrastructure, Transport, and Tourism's Project PLATEAU is being developed**, in which existing data managed by local governments are structured and released to the public. **It is expected that the data released through the Project will be applied. It is also considered an effective project for the standardization of digital twin data used to maintain and manage road infrastructures, for example, and for advancing collaboration among administrators.**

Example of captured data



Source: Materials from the Echizen City, Fukui Prefecture presentation at the Study Group's 3<sup>rd</sup> meeting

### Establishment of standard data models



Source: Materials provided by the Ministry of Land, Infrastructure, Transport and Tourism



## (3) Issues When Constructing, Using, and Applying Metaverse (2/3)

### Construction of models that differ from physical spaces

- When constructing digital twins (including those used in metaverse environments), there are concerns that highly realistic 3D models of physical spaces may be misused for crime or terrorism. A possible approach to prevent such concerns is to allow the construction of models that are deliberately different in shape or form from the physical space.
- When constructing models that are different in shape or form from the physical space, **users should be made aware of this fact. At the same time, it is difficult to evaluate what level of information disclosures is appropriate.**

### Handling of qualifications related to actions in virtual spaces

- It is necessary to consider whether qualifications or other mechanisms should be applied to actions in metaverse, as metaverse usage takes off. If it is found that they are appropriate, it will be necessary to consider how to apply them to specific individual cases.
- Considerations of qualifications or other mechanisms should be linked to the creation of various use cases and it will be necessary to consider both **the relaxation of requirements, as the danger of acts in physical spaces decline, and whether new requirements are needed, given that metaverse is different environment from physical spaces.**

## (3) Issues When Constructing, Using, and Applying Metaverse (3/3)

### Responsibilities of platformers and world providers

#### Requirements on platformers and world providers when providing services

- Platformers are required to implement sufficient technical measures and ensure their effectiveness against illegal acts that exploit security risks.
- Given that the way a world is designed affects the perceptions of users within the world, it is important for platformers and world providers to specify their responses to acts or situations that cause discomfort to ordinary users in the contracts to use their spaces and to increase predictability of their responses.
- In addition to addressing illegal activities, **platformers are expected to specify other individual activities as clearly and concretely as possible in their terms of use**, so that users can understand the permissibility of such activities. It is also envisioned that game master-like users will be present, and that these users will autonomously set the rules of conduct within metaverse communities.

#### Responsibilities over disputes between users

- The Act on the Limitation of Liability of Specified Telecommunications Service Providers for Damages and the Right to Demand Disclosure of Sender Identification Information (Provider Liability Limitation Act) defines conditions for the limitation of liability for damages of specified telecommunications service providers — such as providers and server administrators and operators — when someone's rights are violated due to the distribution of information via specified telecommunications. The Provider Liability Limitation Act also specifies the right to demand a provider to disclose information about the sender and the court procedures for cases involving orders for disclosure of sender information. It is considered the Provider Liability Limitation Act may be applicable to some disputes in metaverse when requirements are met. In other cases, it may be necessary to make virtual space-specific arrangements separate from the Provider Liability Limitation Act.
- In addition, there are a multitude of ways metaverse can be provided. A platformer may provide its own world; a world provider may specify rules that apply to worlds; and an end user may construct a world based on the platform's terms and conditions. Given that disputes between users fall into certain patterns inherent to virtual spaces, it is very likely that questions about who bears responsibility to users will be determined on a case-by-case basis according to how metaverse is provided.
- It is considered advisable **to foster a certain level of shared understanding by accumulating future case studies and arranging each case study individually.**

## (4) Issues Related to Data Acquisition and Usage

### Handling data generated inside the metaverse space

#### Handling logs of user behavior and other data

- It is assumed in metaverse that all phenomena in the virtual space are represented with digital data. Consequently, platformers and world providers have the technical means to acquire and store vast amounts of data generated in their spaces, such as logs of user behavior.
- On the other hand, it should be noted that the storage and management of data protected under secrecy of communications statutes is permissible only in extremely exceptional cases.
- Article 11, Paragraph 2 of the Guidelines for Protection of Personal Information in Telecommunications Business (Personal Information Protection Commission and Ministry of Internal Affairs and Communications Public Notice No. 4 of March 31, 2022) states: “Except where the user’s consent has been obtained or if there is other justifiable cause for noncompliance with the law, a telecommunications carrier shall not retain personal information protected under the secrecy of communications, and even if such retention is permitted, a telecommunications carrier shall delete such personal information promptly after the utilization purpose is achieved.” In principle, personal information protected under secrecy of communications statutes, such as logs of communications, is not allowed to be stored. Even when consent is obtained, in principle, it cannot be considered valid consent without the clear and unambiguous consent of the communicating party.
- Over and above their compliance with the provisions of the Telecommunications Business Act, the Act on the Protection of Personal Information, and other laws and regulations, **it is important that platformers and world providers explain to users what data they are managing.**

#### Handling data in use cases where only business users are the contracting party

- In some use cases like virtual offices, companies — i.e., business users — are the ones to contract with the platformer or world provider to build a metaverse space, and there is no prior consent by an end-user entity to the terms and conditions.
- In these use cases, it is necessary **to clarify what data are being managed and to establish rules to protect end-user entities that are not direct parties to the contract, based on existing rules, the characteristics of metaverse, and the composition of the ecosystem.**

### Acquiring data from physical spaces

- Some metaverse use cases not only make use of data expressed in metaverse, such as motion, but also make use of heart rates and other biometric responses.
- There were opinions that when authenticating an avatar that represents a specific person in a physical space, it is necessary to confirm that the avatar has been registered in a legitimate manner when completing the user contract and it is necessary to ensure a means of authenticating the avatar’s sameness with the actual person.
- The possibility has been raised that the use of smartphones, which are extremely close to a person’s identity, to access metaverse spaces will cause security and privacy issues. **It is necessary to comply with the Act on the Protection of Personal Information and other laws and regulations, and it is necessary to track changes in conditions caused by advances in metaverse UIs.**

## (5) Issues Related to User Interfaces (UI) and User Experiences (UX)

### UI/UX

#### Virtual-reality wearable devices

- Although wearables technology is advancing, making them lighter, the devices do cause stress when worn for long periods because of their weight and bulk.
- As of 2023, prices for leading HMDs are expensive, from 10s to 100s of thousands of yen.
- In addition to six-axis motion tracking devices, various input devices using sensing technologies, such as eye tracking and gesture tracking, are being developed.

#### Communication environments and networks

- To achieve 60 fps frame rates and an ideal metaverse with the application of new input devices, various system and infrastructure optimizations are needed, including widespread high-capacity transmission networks, and distributed rendering processing.

#### Physical effects (psychological, virtual reality sickness, etc.)

- Many young users experience virtual reality sickness, and even experienced users said they were prone to sickness until they got used to virtual reality environments.
- It was pointed out that time lags between the input device, which detects body movements, and the output to the HMD may have an impact on the body.

#### Issues related to metaverse experiences for new users

- There was a voice saying that the threshold for new users to start using metaverse is high, citing the need to own an expensive HMD.
- A view was expressed that for users new to metaverse, the threshold for what users should not do is lower with metaverse, where you are shown a new image of yourself, than with social media.

- It is necessary to keep track of future technological and business trends, while accounting for the actual experiences users have.

### Disparities in virtual reality experiences

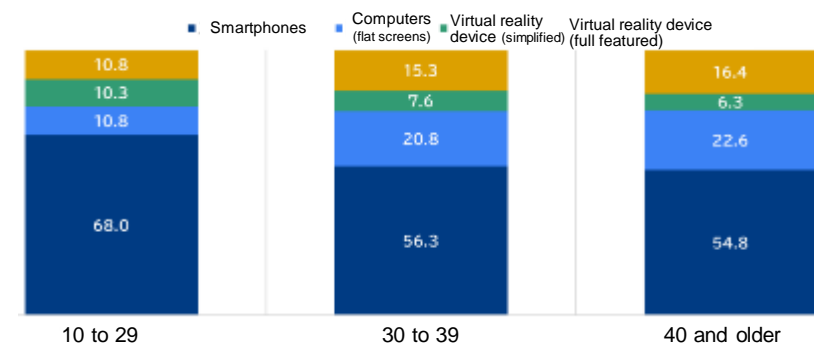
- Virtual reality experiences, usage durations, and purposes vary widely, as do the devices used (smartphones, computers, HMDs).
- Economic and cultural disparities in the users' society may affect the above factors, resulting in differences in whether or not users experience virtual reality at all or what they experience, leading to disparities in virtual reality experiences (virtual reality divide).

Examples of virtual-reality wearable devices



Source: Materials from the Shiftall Inc. presentation at the Study Group's 9<sup>th</sup> meeting

Primary means of accessing metaverse by age group



Source: *Metaverse use and awareness survey results*, Mitsubishi Research Institute, inc.

## (6) Metaverse Developments and Social Impacts (1/2)

### Culture among metaverse users

- A major difference between metaverse and games is that games have set rules, while metaverse does not. One consideration given to the Study Group is users, other than creators, have little idea what they should do in metaverse.
- There are cases where school communities have formed to teach in a classroom setting metaverse culture, society and network formats, such as how to engage in virtual reality sleep, virtual reality romance, and communications.
- People often categorize themselves by their job titles or other attributes, but when they communicate through avatars, many feel their personalities switch. A view was given that Japanese people in particular rarely discuss their work or jobs when in avatar form and they adopt a different personality in metaverse.
- Some users said that using metaverse as a preparatory step to meeting in physical spaces can reduce psychological burdens, for example a student about to study abroad communicates with people at the destination school on metaverse.

### Avatar usage status

- Given the user culture described above, being able to freely choose one's avatar implies gender and appearance freedom and a release from social constraints. On the other hand, there were opinions that saw the potential for this freedom to reflect or even promote existing physical prejudices and gender biases founded on society's conventions on beauty.
- Another opinion was that, in Japan at least, avatars should look similar to the person in physical space (photorealistic avatars) in public situations such as business and education, or when providing services as a business operator.
- There are also research findings for the Proteus Effect, whereby an avatar's identity in metaverse, affects the user's behavior, and that using different avatars in metaverse appears to improve learning outcomes.
- **It is important to keep track of how the usage of avatars and users' perceptions change**, as metaverse become more commonplace.

## (6) Metaverse Developments and Social Impacts (2/2)

### Metaverse technological developments

#### Virtual reality devices

- There is a need to reduce the weight and cost of virtual reality devices as well as lower their physical impact on users in order to popularize metaverse.
- **Further development of device technologies is expected**, including approaches to cover seeing and hearing as well as touch (including temperature), smell, and taste.

#### Rendering latencies and number of simultaneous users in a space

- In implementing a metaverse, there is a tradeoff between the resolution of rendering and network loading. At the present time, latency and rendering degradation are prevented by limiting the number of simultaneous users in a space. However, service quality has been observed to decline as the limit is approached.
- In the future, **application of multi-access edge computing (MEC) rendering and other technologies are expected to be applied that offload processing loads on the cloud's data center side to edge networks.**

#### Improvements to communication environments

- Issues were presented to the Study Group, such as ICT usage environments at companies, radio signal propagation indoors, and IoT and satellite communications. **Further improvements to Japan's communication environment, beginning with 5G, continues to be a vital issue.**

### Digital talent

- The problem of a lack of human resources to construct 3D data was pointed out to the Study Group, when creating digital twins of real areas, particularly in non-urban areas, through public participation.
- Another point of discussion is expanding the user base to further expand metaverse, etc.. Metaverse courses should be held for the general Internet user segment. And smartphone courses should be held for the segment that has trouble using smartphones and other devices, which are prerequisites for metaverse.
- **Looking from the broader perspective of the digital transformation of society as a whole**, rather than concentrating on metaverse alone, **coping with expanding the digital talent pool is an issue, in terms of both service provision and use.**

### Impact of communication environment disparities on participation in Society 5.0

- As we move toward Society 5.0, in which the real and the virtual will be closely connected in the future, including the widespread adoption of metaverse, etc., differences in users' own communication environment, such as limits on communication volumes of mobile lines and the availability of optical lines, will have an impact on participation in Society 5.0. Therefore, it is important to address these issues.

## (1) Directions for Resolving Issues within the Metaverse Space

Given that metaverse is still in its germination stage, resolving the issues raised in Sections 3(1) through 3(4) requires, first of all, the fostering of a common international understanding, promotion of standardization to ensure interoperability, and the establishment of guidelines for providers of metaverse-related services, so as to not stifle innovation.

### Fostering a common international understanding on the approach to metaverse

- It is important to develop a common understanding on the approach to metaverse internationally, as metaverse contain various worlds that cross national borders. This is important given that interoperability should be ensured and given that metaverse will become places for social activities and for citizens to conduct their lives in the same way as physical spaces.
- On this point, countries that share democratic values are gradually working toward a certain level of common understanding. The *G7 Hiroshima Leaders' Communiqué* and the *Ministerial Declaration The G7 Digital and Tech Ministers' Meeting* reached a consensus that metaverse should be based on democratic values. While embodying such democratic values, it is important to further spread them internationally, and it is necessary for Japan to actively contribute to this effort.
- It is necessary for MIC to promote domestic discussions on this matter and foster a common international understanding on the approach to metaverse

### Initiatives to ensure interoperability (such as standardization)

- Ahead of the widespread adoption of metaverse, MIC should support the international standardization of Japan's standards and work to ensure interoperability at the international fora such as ITU-T and MSF.

### Establishment of guidelines for providers of metaverse-related services

- In the future, in order for users to have a deeper understanding of metaverse and, in turn, enjoy richer experiences, platformers and metaverse service providers are required to disclose information to users in an understandable manner in their terms and conditions. Given that metaverse is still in its germination stage, it's important to first investigate the current state of affairs and user needs and then establish guidelines that spell out what items providers should indicate to users so that users can select an appropriate platformer. It is important that making such statements to users become a social norm.
- Secretariat of Intellectual Property Strategy Headquarters under the Cabinet Office has created a summary of issues in the Public-Private Partnership Conference on New Legal Issues Concerning Content in the Metaverse. MIC will likely have to proceed in cooperation and coordination with this body and its summary.

## (2) Directions for Resolving Issues external to the Metaverse Space (1/2)

Investigations and ongoing follow-up study are needed into UI/UX matters and into metaverse developments and their social impacts, described in Section 3(5) and 3(6).

### Ongoing follow-up study on market, technology, and user trends

- MIC need to keep abreast of future user, technology, and market trends, primarily in the areas below. Following the release of the Study Group's report, regular follow-up study will be needed on progress in these areas.

#### User trends

- Avatar usage (including photorealistic avatars)
- The usage of various forms of virtual reality (6-axis, 3-axis, 2D images) and the impact that results from the differences in experiences with each form

#### Technological trends

- Changes in the weight, prices, and functions of virtual reality devices (number of motion sensors, use of senses other than seeing and hearing, functions to prevent virtual reality sickness)
- Advances in technologies, such as rendering, and number of simultaneous users in a space, and implementation of those advances

#### Other market trends

- Development of even more diverse use cases
- Means of authentication that links an avatar to a person in physical space
- Promotion of data organization to enable more efficient and effective digital twin building (such as Project PLATEAU).



## (2) Directions for Resolving Issues external to the Metaverse Space (2/2)

### Investigations into the relationship between metaverse and UI/UX

#### UI/UX

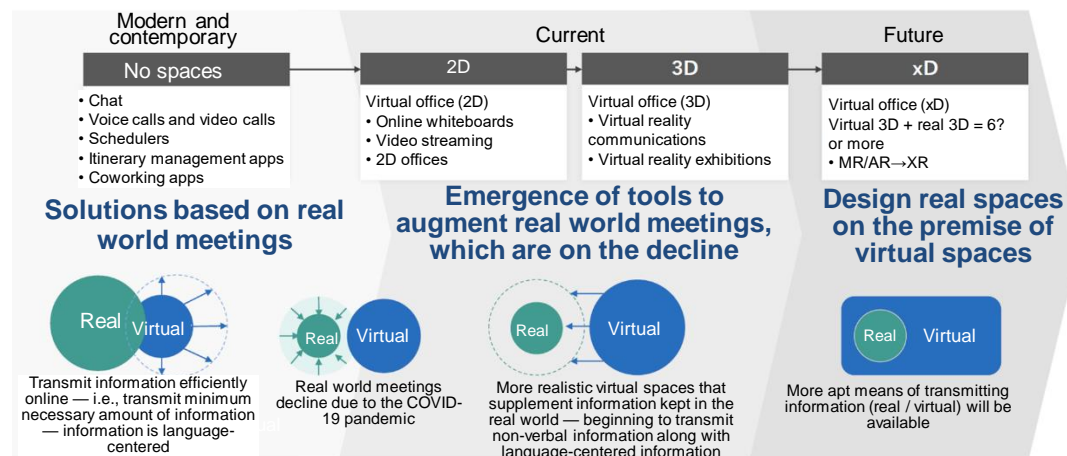
- As shown in the figure below, new services such as virtual reality, augmented reality, and mixed reality (used in metaverse) can themselves be considered a new type of cyberspace UI. It is believed to be important to **investigate the differences between the UI and social media and other existing services and how people's perceptions will change and the impact of the changes when users come into contact with the UI via networks.**
- In conducting such investigations, it is likely necessary to determine whether social media problems like filter bubbles or echo chambers, created by recommendations, will surface in new UX technologies like metaverse, etc.

#### Impact of communication environment disparities on participation in Society 5.0

- Opinions were expressed that as rich content, including metaverse, is expected to expand further, and as billing systems (even unlimited plans) based on communication volumes have become mainstream, particularly with mobile communication services, differences in user communication environments based on service contracts may lead to more or less participation in changes in society, as we move toward Society 5.0.
- **It is important, then, to understand the impact on participation in Society 5.0, along with determining trends in social transformations.**

| The connection between real and virtual

Future possibilities | Reversal of the master-servant relationship between real and virtual



Source: Materials from the NEC Corporation presentation at the Study Group's 8<sup>th</sup> meeting

# Reference 1: Members of the Study Group on the Utilization of Metaverse towards the Web3 Era, Meetings, and Topics Discussed to Date

## Study Group Members

Chair: KOZUKA Souichirou (Professor, Faculty of Law, Gakushuin University)

Vice Chair: ETOU Minoru (Professor, Institute for Open and Transdisciplinary Research Initiatives, Osaka University)

Members: AMEMIYA Tomohiro (Professor, Information Technology Center, University of Tokyo)

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TSUKADA Manabu (Associate Professor, Graduate School of Information Science and Technology, University of Tokyo)

NAKAGAMI Ryuta (Chair, Technology Committee, Japan Smartphone Security Association)

MASUDA Masafumi (Partner, Mori Hamada & Matsumoto)

YASUDA Yosuke (Professor, Graduate School of Economics, Osaka University)

(In the order of Japanese syllabary)

# Study Group Meetings

## Agenda

### 1st Meeting

(August 1, 2022)

1. Operations of the Study Group
2. Explanation of materials from the Secretariat
3. Presentations from members
  - (1) Study Group member Etou — “Social impact of metaverse”
  - (2) Study Group member Ohya — “Metaverse and the landing problem”
4. Exchange of opinions and ideas

### 2nd Meeting

(September 16, 2022)

1. Interviews on examples of metaverse, etc. and virtual world use and application, and a presentation from a member
  - (1) Dai Nippon Printing Co., Ltd. — “Presentation on DNP’s extended reality and metaverse initiatives and extended reality communications business”
  - (2) oVice, Inc. — “oVice, a virtual space where it feels like you are talking side by side”
  - (3) Study Group member Amemiya — “The use and application of metaverse in education: University of Tokyo Virtual Reality Educational Research Center”
2. Exchange of opinions and ideas
3. Explanation from the Secretariat regarding the Solicitation of Proposals Regarding the Future Image of a Society Created via Use of Metaverse, etc. and Challenges to Its Realization

### 3rd Meeting

(October 6, 2022)

1. Interviews on examples of metaverse, etc. and virtual world use and application
  - (1) Toppan Inc. — “Toppan’s metaverse initiatives”
  - (2) Echizen City, Fukui Prefecture — “Case study report by Echizen City, Fukui Prefecture”
  - (3) Ministry of Land, Infrastructure, Transport and Tourism — “PLATEAU, an initiative that provides models for implementing digital twins”
2. Exchange of opinions and ideas

### 4th Meeting

(October 31, 2022)

1. Interviews on examples of metaverse, etc. and virtual world use and application
  - (1) OryLab Inc. — “Case study of social participation by means of avatar robots in a super-aged society and a large housebound population”
  - (2) Shutoko Technology Center — “Initiative to adopt i-DREAMS, a smart infrastructure management system”
  - (3) Komatsu Ltd. — “Presentation on Smart Construction”
2. Exchange of opinions and ideas

### 5th Meeting

(December 2, 2022)

1. Interviews on examples of metaverse, etc. and virtual world use and application, and presentations from members
  - (1) Sony Group Corporation — “Our metaverse initiatives”
  - (2) Study Group member Ishii — “Privacy in virtual spaces: Focus on illegal avatar use”
  - (3) Study Group member Nakagami — “Study of cybersecurity in metaverse”
2. Exchange of opinions and ideas

## Agenda

### 6th Meeting

(December 14, 2022)

1. Interviews on examples of metaverse, etc. and virtual world use and application, and a presentation from a member
  - (1) Study Group member Tsukada — “Issues and requirements for the digital infrastructure needed to realize metaverse: The ideal metaverse is still far away”
  - (2) KDDI Research, Inc. — “Data compression technology that supports metaverse and its standards-making developments”
  - (3) HIKKY — “The forefront of the metaverse economic sphere: A case study of virtual markets”
2. Exchange of opinions and ideas
3. Explanation from the Secretariat regarding the structure of the interim report (tentative table of contents)

### 7th Meeting

(January 27, 2023)

1. Draft of the interim report
2. Findings from the Survey on Overseas Developments in the Use and Application of Metaverse, etc. and Virtual Worlds
3. Exchange of opinions and ideas

### 8th Meeting

(March 23, 2023)

1. Interviews on examples of metaverse, etc. and virtual world use and application
  - (1) Steins Co., Ltd. — “New education and humanities knowledge brought about by metaverse”
  - (2) NEC Corporation — “Metaverse and diversity, equity, and inclusion”
  - (3) Anderson Mori & Tomotsune — “The relationship between the individual (the operator) and the avatar”
  - (4) VRM Consortium, Inc. — “VRM, a Japan-originated standard for interoperable 3D avatars”
2. Exchange of opinions and ideas

### 9th Meeting

(April 20, 2023)

1. Interviews on examples of metaverse, etc. and virtual world use and application
  - (1) Shiftall Inc. — “What do people sense and enjoy inside virtual reality metaverse”
  - (2) Microsoft Japan K.K. — “Microsoft’s metaverse technology supports digital transformations”
  - (3) Secretariat of Intellectual Property Strategy Headquarters, Cabinet Office — “Summary of issues related to new legal issues concerning content in metaverse” (draft)
  - (4) Mitsubishi Research Institute, inc. — “Trends related to metaverse”
2. Exchange of opinions and ideas

### 10th Meeting

(May 30, 2023)

1. Draft of the report outline
2. Exchange of opinions and ideas

### 11th Meeting

(June 14, 2023)

1. Draft report
2. Exchange of opinions and ideas

### 12th Meeting

(July 11 to 13, 2023)

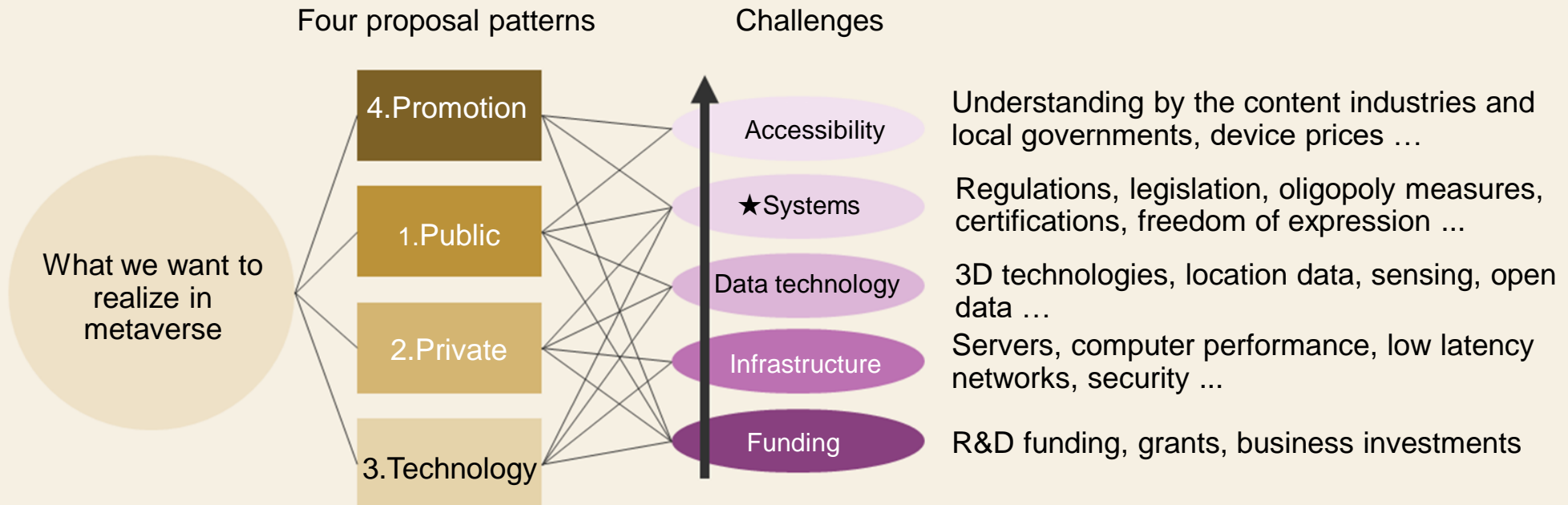
1. Draft report (discussed via email)

## Reference 2: Opinions Received through the Solicitation of Proposals (October – November, 2022)

- MIC held the Solicitation of Proposals Regarding the Future Image of a Society Created via Use of Metaverse, etc. and Challenges to Its Realization over 59 days, from October 3 to November 30, 2022, to promote a greater range of discussions at the Study Group. The Study Group received a total of 31 opinion proposals.
- The figure below broadly categorizes the challenges presented in the submitted proposals.

Mentioned challenges span the whole spectrum of accessibility, systems, data technology, infrastructure, and funding

- Existing challenges are also touched on in the proposals. In general, there are five areas.
- The priority of where to start may vary from case to case, but in essence, it is assumed the top problems will be solved beginning with capital investments, as shown in the figure below.
- Nearly all the proposals touched on the necessity of systems, though to what degree depended on what each proposal wanted to achieve.



- To hear comments and opinions from the position of young users, the main metaverse user demographic, the Secretariat held a roundtable discussion with students. Below is a brief outline of the roundtable discussion.

Date and time: Monday, May 15, 2023, from 1 p.m. to 2:30 p.m.

Participants: Seven (Four men and three women. Two participated as avatars.)

Metaverse use by the participants: Ranged from no experience (only experienced virtual reality in a lab setting) to 20 hours a week

## Main comments and opinions

• = Opinion from an individual participant  
\* = Summary by the Secretariat

### Metaverse attractions / Reasons for not using metaverse

- I meet people I know in physical space in virtual space, but more often the communities I join grow through friends of friends in virtual reality. In physical spaces I usually adopt a formal attitude depending on the position of the person I am talking to (teacher, boss, older person, etc.), whereas in metaverse, I don’t know each other’s backgrounds, so I can communicate casually without worrying about age differences or whatever.
- Before I went to study abroad, I communicated with people at the destination school on metaverse. By being able to share a common feeling with people there before I left, my psychological burden overseas was much lower.
- \* Reasons for not using metaverse included “HMDs are expensive” and “no one around me uses it, so I don’t know how to enjoy it”.

### Virtual reality sickness

- \* Six of the seven students experienced virtual reality sickness. Participants who currently use metaverse for long periods said they were prone to getting sick until they got accustomed to virtual reality.
- On the device, setting the viewpoint at a fixed angle, such as 30 or 45 degrees, instead of linearly changing the viewpoint, may reduce the sensation of sickness.

### Confirmation of the terms of use / Metaverse conduct

- Even if you don’t read the terms of use closely, rules are displayed when you enter the world and manners are shared within communities. So, you naturally just avoid conduct that would cause someone discomfort.
- I don’t use metaverse, but seeing that a different you is generated in metaverse, I imagine that the threshold for what users should not do is lower than on social media. (Conversely, another person who doesn’t use metaverse that often gave an opposing view: “Even so, I wouldn’t do something I normally wouldn’t do.”)

### Hopes for metaverse / What metaverse-related topic would you like to research

- \* Hopes expressed included transforming human interactions from social media and other text-based formats to metaverse and applying metaverse in medicine, education, job-searching, and other situations.
- \* Research topics mentioned included fused bodies (two people sharing one body in virtual reality) and human relationships in metaverse as well as designing cities by backcasting in virtual reality from the future and trying to build an open campus in virtual reality.